

Project and Data Description

Project Overview

- In this preregistered study, we investigated the effects of tDCS (transcranial direct current stimulation) on performance monitoring in patients with obsessive-compulsive disorder (OCD) and healthy individuals. Cathodal and sham tDCS was applied over the presupplementary motor area (pre-SMA) in two separate sessions, each followed by EEG recording during performance of a flanker task.

Procedure

- The study employed a randomized, double-blind, sham-controlled, crossover design. Patients with OCD and matched healthy control (HC) participants were invited for two experimental sessions and received one session of cathodal and one of sham tDCS.
 - o The cathodal electrode was positioned over the pre-SMA (electrode site FCz) and the anodal reference electrode was placed on the right cheek.
 - o In the active tDCS condition, a direct current of 1.5 mA was administered for 20 min. In the sham condition, the current was applied for only 40 s at the beginning of the 20 min period.
- Following the stimulation, participants performed an arrow version of the flanker task while EEG was recorded.
 - o Stimuli consisted of five vertically arranged arrows pointing to the left or right.
 - o Participants were instructed to indicate the direction of the central target arrow as quickly and accurately as possible by button press.
 - o The central target arrow was flanked by arrows pointing in the same direction (50% congruent trials) or by arrows pointing in the opposite direction (50% incongruent trials).

Hypotheses

- Our primary hypothesis was that compared to sham tDCS, cathodal tDCS would reduce the error-related negativity (ERN) amplitude across healthy individuals and patients with OCD.
- In addition, we expected that if inhibitory pre-SMA stimulation by cathodal tDCS attenuates performance monitoring processes, error rates would be increased and behavioral adaptation after error commission, that is, post-error slowing (PES), would be reduced.
- Moreover, we predicted that cathodal tDCS would increase the amplitude of the error positivity (Pe).
- To explore effects of cathodal tDCS on performance monitoring during correct responses, we additionally analyzed the correct-response negativity (CRN).
- Regarding group differences, we predicted increased ERN amplitudes in patients with OCD compared to healthy participants in the sham condition.
- We expected the tDCS-induced ERN attenuation to be more pronounced in the patient group compared to the control group.

Preregistration

Hypotheses, experimental design, sample size, and analysis plan of this study were preregistered on the Open Science Framework (<https://osf.io/7z8hj/>).

Data Description

- Data set: 'Single_Trial_Data.rda'
- 53760 observations (56 participants, 2 sessions per participant, 480 trials per session), 13 variables

VARIABLE	DESCRIPTION VALUES	VARIABLE
participant_id	Participant identifier	C_01 to C_30 and P_01 to P_30
group	Participant group	HC = healthy control participant OCD = patient with OCD
session	Experimental session	T1 = first experimental session T2 = second experimental session
stimulation	Stimulation condition	verum = cathodal tDCS sham = placebo tDCS
trial	Trial number within the flanker task	1 to 480 per participant and session
stimulus_type	Stimulus type in the flanker task	congruent = congruent stimulus incongruent = incongruent stimulus
response_type	Response type in the flanker task	correct = correct response incorrect = incorrect response miss = missing response
rt	RT in the flanker task	RT in milliseconds NAs for trials in which no response was made (miss)
rt_log	Log-transformed RT in the flanker task	log(RT) in milliseconds NAs for trials in which no response was made (miss)
rt_invalid	Indication whether RT in the flanker task was < 100 ms or > 800 ms	TRUE FALSE NAs for trials in which no response was made (miss)
MFN_0_100_FCz	Medial-frontal negativity (MFN); response-locked ERP from 0 to 100 ms at electrode FCz	Mean amplitude in microvolts NAs for trials with EEG artifact
Pe_200_400_Pz	Error positivity (Pe); response-locked ERP from 200 to 400 ms at electrode Pz	Mean amplitude in microvolts NAs for trials with EEG artifact
P3_300_500_CPz	P300; stimulus-locked ERP from 300 to 500 ms at electrode CPz	Mean amplitude in microvolts NAs for trials with EEG artifact